

13. A DNA molecule according to claim ¹¹12, wherein said arginine is replaced by a lysine.

~~14. A DNA molecule according to claim 11, wherein said DNA encodes a mutant of whole *Bordetella pertussis* toxin.~~

15. A DNA molecule according to claim ¹¹12, wherein said DNA encodes a mutant of whole *Bordetella pertussis* toxin.

16. A DNA molecule according to claim 13, wherein said DNA encodes a mutant of whole *Bordetella pertussis* toxin.

~~17. A substantially detoxified mutant of at least a portion of the S1 subunit of *Bordetella pertussis* toxin, said mutant comprising an epitope that contributes to immunoprotection against *Bordetella pertussis* toxicity.~~

18. A substantially detoxified mutant according to claim 17, wherein said mutant comprises a mutation at arginine 9 in which said arginine 9 is replaced by another amino acid.

19. A substantially detoxified mutant according to claim 18, wherein said arginine is replaced by a lysine.

20. A substantially detoxified mutant according to claim 17, wherein said mutant is a mutant of whole *Bordetella pertussis* toxin.

21. A substantially detoxified mutant according to claim 18, wherein said mutant is a mutant of whole *Bordetella pertussis* toxin.